GAU, Faculty of Engineering

Course Unit Title	Principles of Software Design
Course Unit Code	SEN322
Type of Course Unit	Compulsory for SE
Level of Course Unit	3rd year BSc
National Credits	3
Number of ECTS Credits Allocated	5
Theoretical (hour/week)	3
Practice (hour/week)	0
Laboratory (hour/week)	0
Year of Study	3
Semester when the course unit is delivered	6
Mode of Delivery	Face to face, E-learning
Language of Instruction	English
Prerequisites	SEN201
Corequisites	
Recommended Optional Programme Components	

Objectives of the Course:

- Introduce the principles, methods, and artifacts of software design for building maintainable and scalable software systems
- Develop student ability to apply design principles, patterns, and architectural views to software problems
- Provide practical experience with UML-based design modeling, refactoring, and design evaluation
- Encourage students to connect software quality attributes with design decisions and trade-off analysis

Learning Outcomes

When this course has been completed the student should be able to		Assess.
1	Learn how to explain core software design principles, quality attributes, and architectural concerns	1,3
2	Learn to model software structure and behavior using UML and related design notations	1,3
3	Learn how to apply object-oriented design principles and common design patterns to software design problems	1,3
4	Learn how to evaluate design alternatives with respect to maintainability, modifiability, and reuse	1,3
5	Understand the fundamentals of software architecture views, interface design, and refactoring	1,3
6	Learn how to prepare and present a software design project by applying design principles, patterns, and documentation practices	1,3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab Work

Course's Contribution to Program

		CL
1	Ability to understand and apply knowledge of mathematics, science, and engineering	2
2	Ability to design and conduct experiments as well as to analyze and interpret	2
3	Ability to work in multidisciplinary teams while exhibiting professional responsibility and ethical conduct	3
4	Ability to apply systems thinking in problem solving	3
5	Knowledge of contemporary issues while continuing to engage in lifelong learning	2
6	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice	3

7	Ability to express their ideas and findings, in written and oral form	3
8	Ability to design and integrate systems, components or processes to meet desired needs within realistic constraints	3
9	Ability to approach engineering problems and effects of their possible solutions within a well structured, ethically responsible and professional manner	3

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Subject	Exams
1	1	Introduction to Software Design	
2	2	Object-Oriented Design Principles and SOLID	
3	3	Cohesion, Coupling, and Modularity	
4	4	UML for Software Design	
5	5	Architectural Styles and Design Views	
6	6	Design Patterns I: Creational Patterns	
7	7	Design Patterns II: Structural and Behavioral Patterns	
8			Midterm
9	8	Quality Attributes and Design Trade-offs	
10	9	Interface Design and Component Design	
11	10	Refactoring and Maintainability	
12	11	Design Documentation and Evaluation	
13	12	Software Design Project and Presentation	
14	13	Course Review	
15			Final

Recommended Sources

- Textbook: Applying UML and Patterns, 3rd Edition, Craig Larman Supplementary: Software Architecture in Practice, 4th Edition, Len Bass, Paul Clements, and Rick Kazman Supplementary: Head First Design Patterns, 2nd Edition, Eric Freeman and Elisabeth Robson

Assessment

Midterm exam	25 %
Final exam	35 %
Design project	30 %
Quizzes	10 %

ECTS Allocated Based on the Student Workload

Activities	Number	Duration (hour)	Total Workload (hour)
In-class lecture (including exam weeks)	15	3	45
Midterm exam	1	1.5	1.5
Midterm exam preparation	1	15	15
Final exam	1	1.5	1.5
Final exam preparation	1	20	20
Quiz	2	2	4
Assignment	4	3	12
Project/presentation/report writing	1	16	16
Lab and tutorial	0	0	0
Self-study	15	2	30

Total Workload	145.00
Total Workload / 30 (h)	4.83
ECTS Credit of the Course	5